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The who, why and how of spinoffs*

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Abstract: Studies have consistently found that entrepreneurs who enter industries in which they have prior experience as employees perform better. We nevertheless know little about what accounts for this effect. The presumed explanation has been that experienced entrepreneurs benefit from knowledge acquired in their former jobs. But they might also differ from entrepreneurs without industry experience on a variety of other dimensions: Preferential access to resources or differing motivations, for example, may account for their decisions to enter known industries instead of new ones. Combining novel data from a representative survey of entrepreneurs with the matched employer-employee database of all residents in Denmark, we examined how entrepreneurs with prior industry experience differed from those without it, and the extent to which those differences could account for the performance premium associated with prior industry experience. We found that entrepreneurs with industry experience came from younger, smaller and more profitable parent firms, and that they recruited more experienced employees, worked harder and placed less value on having flexible hours. The recruitment of more experienced employees and the greater effort exerted appeared to account for at least some of the performance advantage associated with prior industry experience.

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Scholars from a wide range of perspectives, from organization theory and strategy to economics and finance, have long been interested in the sources of homogeneity and heterogeneity among young firms. Within these literatures, one of the more consistent findings has been that entrepreneurs with prior experience in an industry appear advantaged relative to those without it. Researchers have assigned the organizations established by these experienced entrepreneurs a variety of names – spinoffs, spinouts, spawn and progeny – but, regardless of the label assigned, these firms have been found to survive longer (Brüderl and Preisendörfer 1998; Phillips 2002; Agarwal et al. 2004; Dahl and Reichstein 2007), to grow faster (Brüderl and Preisendörfer 1998), to earn larger profits (Dahl and Sorenson 2012), to attract more funding at higher valuations (Chatterji 2009), and to introduce more innovative products (Agarwal et al. 2004).

The assumption has generally been that these advantages emerge from the transfer of knowledge from parent firms – the prior employers of these entrepreneurs – to their progeny. Spinoff entrepreneurs, for example, may have access to valuable innovations developed at their prior employers (Bhide 1994; Anton and Yao 1995; Agarwal et al. 2004). Or, they might benefit from a more general understanding of effective organizational blueprints and routines for the industry (Phillips 2002). But the evidence in support of this mechanism remains scant. Few studies have had direct information about the transfer of knowledge. Those that have, moreover, have found that spinoffs outperform other startups even after controlling for their better access to technological and organizational knowledge (Phillips 2002; Agarwal et al. 2004; Chatterji 2009), suggesting that spinoffs do not benefit *only* from this mechanism.

One possible explanation for this residual effect is that spinoffs also have preferential access to other resources: Founders with experience in the industry, for example, have social

connections that might help them to identify and recruit able employees to their ventures (Sorenson and Audia 2000). Investors may also perceive prior industry experience as a positive signal, increasing the ability of the founders of spin-offs to raise capital (MacMillan et al. 1985; Burton et al. 2002; Chatterji 2009). These financial resources, moreover, could have a self-confirming character if they allow firms to hire better employees, to expand more rapidly and to survive downturns.

Another possible explanation is that spin-off entrepreneurs have different motivations for founding their firms. Many entrepreneurs open their own firms for the intrinsic rewards of doing so—being one's own boss, being able to spend more time with family and friends, feeling a sense of accomplishment (e.g., Benz and Frey 2008; Wasserman 2012). Those who start businesses in industries in which they do not have experience have made a conscious decision to do something different. Perhaps they did not like their jobs. Perhaps they were not good at them. Regardless of the reasons underlying their choices, this self-selection may mean that spin-off entrepreneurs differ from other founders in terms of their abilities and the effort they exert.

To date, however, researchers have generally not been able to explore these mechanisms. Doing so requires not just detailed information about a set of startups and the employment histories of their founders but also insight into the attitudes of these founders. Though numerous industry-level datasets have been assembled, they generally have had limited information on each founder and therefore have been severely circumscribed in their ability to illuminate the mechanisms involved. Here, we addressed these issues by combining two unusual data sets. The first is a survey of a representative sample of individuals who founded companies in Denmark in 2004 ($N = 1361$), which asked a variety of questions about their motivations for starting a business and the extent to which they received assistance from

their social connections. Statistics Denmark has linked this cross-sectional survey to a second, longitudinal, employer-employee database, which allowed us to establish the employment histories of these founders, to identify the employees they hired, and to assess the performance of their ventures.

We found that spinoff entrepreneurs differed from those entering industries in which they did not have experience on multiple dimensions: They had *less* managerial experience than non-spinoff entrepreneurs; they came from smaller, younger and more profitable parent firms; they recruited fewer family members and more former colleagues to their startups as employees; and they placed less value on flexible hours and on some of the intrinsic rewards related to self-employment.

As in prior single-industry studies, Danish spinoff entrepreneurs, on average, enjoyed a substantial survival advantage over non-spinoff entrepreneurs. However, of the numerous differences identified, only a few correlated with the performance of their ventures: Having a more experienced workforce and being willing to work harder both explained a portion of the performance differences between spinoff and non-spinoff entrepreneurs. Moreover, we found few differences across industries in either the distinguishing characteristics of spinoff entrepreneurs or the relationships between those characteristics and performance.

Our results inform the research on spinoffs in a number of ways: (1) Companies founded by those with experience in the industry enjoy performance advantages across a wide range of industries. (2) The dominant explanation for this effect – the transfer of technological and business model innovations – can only account for a fraction of this performance differential, at best. (3) Very few spinoffs emerge from disagreements between entrepreneurs and their prior employers (cf. Klepper 2007). (4) Spinoff entrepreneurs recruit higher quality employees. (5) Spinoff entrepreneurs also appear to exert more effort.

The spinoff advantage

Numerous labels – such as spinoffs, spinouts, spawn and progeny – have been applied to companies founded by those with prior experience in the industry. For clarity, we use the term "spinoff" consistently.[1] The criteria used to identify spinoff entrepreneurs have also varied. Some studies have included only those who had worked for an existing firm in the industry *immediately* before founding their venture (e.g., Phillips 2002; Agarwal et al. 2004). Others have included all those with experience in the industry at any prior point (e.g., Klepper 2007; Chatterji 2009). In some cases, any experience within the industry counted (e.g., Phillips 2002; Chatterji 2009); in other cases, only prior *managerial* experience in the industry qualified (e.g., Agarwal et al. 2004; Klepper 2007). Though our results remain robust to any of these definitions, being a spinoff entrepreneur in the analyses reported refers to the broadest of these possible definitions: having previously been employed, at some point between 1980 and 2003, in any capacity in another firm in the same four-digit industry as one's startup.[2]

Regardless of the specific definition, a large and growing number of studies have found that spinoffs perform better than other startups. In one of the first studies on this topic, Phillips (2002), for example, found that Silicon Valley law firms formed by a former partner from an existing Silicon Valley law firm enjoyed 44% lower failure rates than those founded by other lawyers. Subsequent studies have found that spinoffs experience lower failure rates than other startups in a wide variety of industries, from automobiles (Boschma and Wenting 2007; Klepper 2007) and disk drive manufacturing (Agarwal et al. 2004) to fashion design (Wenting

[1]Note, however, that some have also used the term "spinoff" for entrepreneurs who may not have any prior industry experience. Eriksson and Kuhn (2006) and Muendler and Rauch (2011), for example, use it to refer to teams of founders who had previously been coworkers (in any industry).

[2]Though our data did not allow us to track individuals prior to 1980, fewer than 20% of the respondents had left-censored employment histories.

2008), and that they also appear to outperform non-spinoffs on operational measures of performance (e.g., Agarwal et al. 2004; Chatterji 2009).[3]

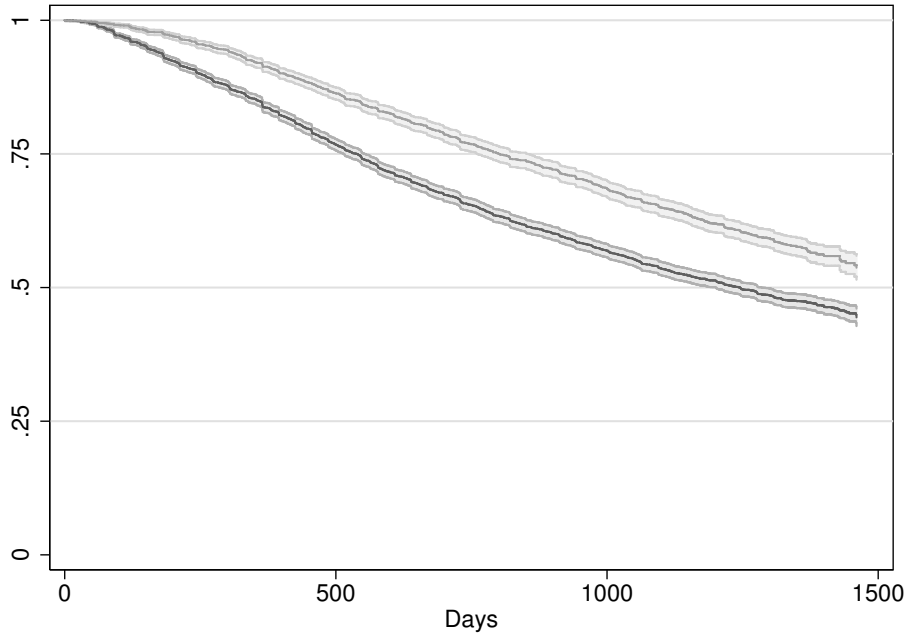

Figure 1: Kaplan-Meier survival plot for spinoffs (light) and non-spinoffs (dark)

Though multi-industry studies have been scarce (for exceptions, see Dahl and Reichstein 2007 and Dencker et al. 2009), this phenomenon appears quite general. Figure 1, for example, provides a Kaplan-Meier plot for the failure rates, over their first four years of operation, for all startups in Denmark founded in 2004 ($N = 6799$).[4] The upper line plots the cumulative survival rate for spinoffs (with the shaded region depicting the 90% confidence interval for the estimate) – firms in which the founder had prior experience in the same four-digit industry

[3]Exceptions exist. Shrader and Siegel (2007), for example, found a negative correlation between industry experience and sales growth and profitability. But their study only included firms that went public within six years of being founded and that survived for at least ten years post-IPO. The research design therefore introduces a large degree of selection bias into their estimates.

[4]Though the analysis in the remainder of the paper focuses on the 1,361 survey respondents, this plot uses a larger set of startups identified using only registry data. Figure 3 (in the Appendix) provides a parallel analysis using only the survey respondents.

as his or her startup – while the lower line plots the same curve for non-spinoffs. On average, over the first four years of their lives, spinoffs enjoyed survival rates roughly ten percentage-points higher than non-spinoffs. This gap in survival rates between spinoffs and non-spinoffs in Denmark emerges quickly, within only a few months of founding, and persists without any obvious erosion as firms mature.

Despite the near ubiquity of the finding that spinoff entrepreneurs outperform those entering from outside the industry, what factors underly this effect remains an open question. We see three broad classes of mechanisms that might account for it: (i) Spinoff entrepreneurs bring valuable intellectual capital to their ventures (knowledge); (ii) spinoff entrepreneurs have social capital that assists them in building successful organizations (reputation and relationships); and (iii) self-selection in who remains in an industry may mean that spinoff entrepreneurs have greater aptitude and exert more effort (motivations).

Our approach to exploring which of these factors matter most has been first to examine how spinoff entrepreneurs and their companies differ from non-spinoff entrepreneurs using information from the survey and the employer-employee database (described in detail in the Appendix). If spinoff and non-spinoff entrepreneurs do not differ on some dimension, then that factor cannot account for the superior performance of spinoff entrepreneurs (though it might have its own effects on firm performance). After isolating those dimensions on which the two types of entrepreneurs vary, we then regressed those factors on performance to explore the extent to which they might account for the spinoff advantage.

Knowledge

Perhaps the most commonly claimed explanation for the better performance of spinoffs has been superior access to private or tacit information relevant to the industry. Researchers

have nonetheless differed in the kinds of knowledge that they have highlighted. One group of studies, mostly from organizational scholars, has focused on managerial knowhow. Phillips (2002), for example, argued that founders with prior experience in the industry have access to organizational blueprints for establishing more effective and reliable routines in their fledgling firms (cf. Feldman et al. 2012). He further reasoned that these blueprints would prove most valuable when they came from larger, older and more successful firms, as the success and stability of these parents suggest that they had more effective blueprints. Consistent with these arguments, Phillips (2002) found that law firms founded by former partners of incumbent law firms had lower exit rates than those started by attorneys without managerial experience. He also found that spinoffs from more successful and larger parents performed better.

Interestingly, others, using a similar logic, have contended that spinoff founders coming from smaller, younger firms should have an advantage. The key difference in the assumptions behind these diverging expectations has to do with the nature of the managerial problem: Whereas Phillips (2002) assumes that the same blueprints should ensure success for the young and the old, the large and the small, others believe that running a startup raises its own unique set of managerial challenges. As a result, entrepreneurs should benefit more from employment experience in small firms than in large ones (cf. Lazear 2005). Consistent with this assumption and its implication, Sørensen and Phillips (2011), studying a cross-section of Danish startups, found that organizations started by entrepreneurs who had previously been employed at smaller firms both survived longer and earned more money.

A second group of studies, mostly from economists and students of strategy and focused more on high-technology industries, has emphasized technological knowledge. Agarwal et al. (2004), for example, argued that spinoff entrepreneurs benefit from preferential access to

the product designs and production processes of their former employers. Analyzing data from the hard disk drive industry, they found that spinoffs produced drives closer to the technological frontier – with higher areal densities and more frequently using the most recent form factors – than non-spinoffs. Even among spinoffs, those whose founders had experience in parent firms closer to the cutting edge entered with more advanced products themselves. Subsequent studies have found strong associations between the technological positions of parents and their progeny in lasers (Klepper and Sleeper 2005), medical devices (Chatterji 2009) and electronics (Yang et al. 2010).

To assess the extent to which spinoff entrepreneurs might benefit from better access to knowledge, we began by comparing their answers to those of non-spinoff entrepreneurs on three relevant questions from the survey.[5] Entrepreneurs indicated the extent to which they considered industry experience, managerial experience and "being an expert" as important to the success of their businesses, choosing either "very important," "important," or "not important" as a response. The upper panel of Table 1 compares the mean responses provided by spinoff entrepreneurs versus non-spinoff entrepreneurs and the Mann-Whitney p-value for the probability that the difference between these means reflects a true difference in the underlying population means.[6]

The fourth column reports the coefficient for an ordered logit regression with the question responses as a dependent variable and the number of years of prior experience in the same four-digit industry (0 for non-spinoffs) as the only regressor. Note that the mean differences and the ordered logit coefficients do not convey the same information. Whereas the mean differences depend more on the distinction between spinoff and non-spinoff entrepreneurs,

[5]Please note that the original survey had been implemented in Danish. The questions and answers reported in the paper represent our own translations into English.

[6]The Mann-Whitney test does not require an assumption of normality. It therefore offers a more appropriate test of the difference in means between two ordinal measures than a t-test.

the ordered logit coefficients also reflect the extent to which those with more experience in the same industry differ from those with less. The final column reports the number of valid cases for each question or measure.

Both spinoff and non-spinoff entrepreneurs considered industry experience important. In both groups, "very important" represents the modal response. Spin-off entrepreneurs nevertheless felt more strongly about the value of industry experience and expertise. By contrast, though both groups also viewed managerial experience as important, they did not differ noticeably in their opinions. These perceptions, however, may represent an *ex post* rationalization of the choices that entrepreneurs had already made.

Table 1: Bivariate associations for measures of knowledge

	Mean (Spinoff)	Mean (Other)	Mann-Whitney p-value	Ordered logit	N (of 1,361)
How important do you find industry experience to the success of your business?	2.57	2.39	0.000**	0.065 (0.014)**	1,209
How important do you find managerial experience to the success of your business?	1.99	1.99	0.984	-0.010 (0.012)	1,176
How important do you find being an expert or specialist a key to the success of your business?	1.96	1.81	0.001**	0.050 (0.012)	1,178

	Mean (Spinoff)	Mean (Other)	t-test p-value	Poisson / OLS	N (of 1,361)
Work experience: Years employed in any job prior to founding firm	14.7	15.1	0.481	0.047 (0.007)**	1,361
Industry experience: Years employed in the same 4-digit industry prior to founding firm	6.47	0.00			1,361
Related industry experience: Years employed in the same 2-digit (but different 4-digit) industry	2.48	1.98	0.036*	0.064 (0.019)**	1,361
Managerial experience: Years employed in the senior--most ranks of their prior employers	0.46	0.73	0.037*	-0.076 (0.038)*	1,361
Parent firm age: Prior employer age in years	15.1	20.3	0.000**	-0.122 (0.008)**	1,158
Parent firm size: Average number of employees of prior employer for five years before founding	718	1934	0.000**	-0.719 (0.001)**	1,162
Parent firm ROA: Average return on assets of prior employer for five years before founding	0.99	0.25	0.000**	0.005 (0.002)*	1,162

Standard errors reported in parentheses. Significance levels: † : 10% * : 5% ** : 1%

The lower panel of the table then compares spinoff and non-spinoff entrepreneurs on

several objective measures of experience.[7] Spinoff entrepreneurs did not differ from other entrepreneurs in terms of their overall experience ($p = .481$). They did, however, differ in terms of the industries in which they had experience. Of course, by definition, spinoff entrepreneurs had more industry experience: On average, spinoff entrepreneurs had roughly 6.5 years of experience in the industry before starting their ventures. Not only did they have more industry experience, but also they had more experience in related industries: an average of 2.5 years (versus 2 years for non-spinoff entrepreneurs).

Interestingly, spinoff entrepreneurs had *less* managerial experience than non-spinoff entrepreneurs. Whereas spinoff entrepreneurs had .46 years in the managerial ranks, on average, non-spinoff entrepreneurs had nearly 50% more (.73 years). That's somewhat surprising given the fact that numerous accounts have highlighted prior managerial experience as one of the factors favoring spinoff entrepreneurs (e.g., Phillips 2002; Dencker et al. 2009).

The final three variables describe their previous employers. Spinoff entrepreneurs came from younger firms (an average of 15 years old versus more than 20 years for non-spinoffs), smaller firms (718 employees, on average, versus 1,934 employees) and more profitable firms (in terms of return on assets).[8] Those facts seem more consistent with the idea that startups pose their own managerial challenges than with the idea that proven organizational blueprints work best for all firms at all stages of maturity.

[7]Because the measures in the lower half of the table represent continuous counts, we used t-tests to compare the means and we regressed the (logged) number of years of industry experience (plus one) on these measures using Poisson regression. For ROA, a continuous measure with both positive and negative values, we estimated a least squares regression coefficient.

[8]Gompers et al. (2005) reported similar results analyzing spinoffs from a sample of public firms in the United States.

Reputation and relationships

Though spinoff entrepreneurs undoubtedly do accrue industry-specific human capital from their prior experience in the industry, they also acquire industry-specific social capital, in the form of a reputation and relationships. Several factors suggest that this social capital might also prove valuable, in particular in assembling the resources for a new venture.

Investors, employees, buyers and suppliers all face substantial uncertainty when trying to determine whether to invest in or to do business with a fledgling firm. Is the idea good? Can the entrepreneur run a firm? Will customers buy? Social capital often allows entrepreneurs to overcome this uncertainty. Would-be investors or early employees, for example, may view prior employment as a form of endorsement. Some firms have a reputation for attracting and developing high-quality employees. Having been an employee at one of them therefore suggests a certain level of acumen and promise. Burton et al. (2002), for example, found that entrepreneurs from firms with a reputation for producing spinoffs had a higher probability of receiving financing from venture capitalists (see also Higgins and Gulati 2003; Chatterji 2009). Not only might these reputations prove valuable to securing funding, but also they may convince skeptical potential employees to join fledgling firms.

In addition to their reputations, spinoff entrepreneurs may also benefit from their personal connections to others in the industry. Workplaces provide settings in which individuals meet and interact with one another. Coworkers quite commonly become friends. Feld (1981), for example, reported that workplaces accounted for a larger proportion of friendships in America than any other source except family.

Friends and colleagues in turn have more favorable beliefs about one another than those without such relationships. Selection means that these connections most commonly form among those who hold each other in higher regard. But psychological biases also reinforce

this tendency. Mere contact generates positive affect and therefore favorable opinions of others (Sorenson and Waguespack 2006). Confirmation biases meanwhile ensure that friends often disregard information that might lead them to believe otherwise (Wason 1968). These favorable perceptions, therefore, help to assuage potential employees' concerns about the prospects of joining friends' companies. Not surprisingly then, family, friends and former colleagues account for a large proportion of the early employees of entrepreneurial ventures. Ruef (2010), for example, reports that they represented 95% of the members of founding teams in a representative sample of startups in the United States.

Of course, the hiring of family, friends and former colleagues in general has somewhat ambiguous implications for firm performance. On the negative side, entrepreneurs' biased beliefs about these individuals may lead them to hire or promote family, friends and former colleagues ahead of others more qualified. But, on the positive side, it allows entrepreneurs to avoid adverse selection in the labor market (Montgomery 1991). They need not rely simply on those looking for a job. Hiring those they know may also engender trust within the organization and facilitate the establishment of organizational routines (Phillips 2002; Timmermans 2010, 2012). Timmermans (2012), for example, found that startups staffed by employees with more prior experience with one another had significantly higher survival rates than those comprised of strangers.

Spinoff entrepreneurs also have an added advantage in hiring their former coworkers. These colleagues have experience in the industry and therefore bring industry-specific human capital to the venture. Prior experience in the industry therefore gives these individuals preferential access to the pool of employees with the highest expected productivity (Sorenson and Audia 2000).

Table 2 explores whether spinoff and non-spinoff entrepreneurs differed in their access to

financial resources and in whom they hired. The upper panel, once again, reports data from the survey.[9] Spinoff entrepreneurs did not differ markedly in their access to financial capital, either from family and friends ($p = .535$) or from venture capitalists ($p = .796$). They did, however, report substantial differences in their recruiting patterns: Spinoff entrepreneurs relied less on family to staff their ventures but more on former colleagues.

Table 2: Bivariate associations for measures of resources

	Mean (Spinoff)	Mean (Other)	Mann-Whitney p-value	Ordered logit	N (of 1,361)
Did you receive a loan or investment from family, friends or other acquaintances?	1.14	1.16	0.535	-0.876 (0.032)**	1,056
Did you receive financing from venture capitalists?	1.02	1.02	0.796	-0.076 (0.085)	1,017
How many of the initial employees were...					
... close family?	1.20	1.29	0.030*	-0.069 (0.025)**	595
... other family?	1.03	1.06	0.096†	-0.143 (0.081)†	578
... former colleagues?	1.41	1.23	0.000**	0.025 (0.020)	586
... other friends or acquaintances?	1.18	1.17	0.975	-0.071 (0.033)*	584

	Mean (Spinoff)	Mean (Other)	T-test Pr-value	Poisson/ OLS	N (of 1,361)
Household wealth: Net worth in Danish kroner	206,238	234,851	0.581	7,338.2 (5,642.7)	1,361
Parent wealth: Sum of parents' household net worth in Danish kroner	620,084	640,078	0.905	-436.8 (18,150)	1,361
Region tenure: Years living in same township as startup prior to founding	4.86	4.52	0.337	0.091 (0.013)**	1,361
Employee work experience: Average years of experience in any industry	3.70	2.55	0.001**	0.206 (0.015)**	1,361
Employee industry experience: Average years of experience in same 4-digit industry	1.42	0.22	0.000**	0.873 (0.031)**	1,361
Employee region tenure: Average years of experience in same township	1.98	1.27	0.001**	0.219 (0.021)**	1,361
Common experience: Average years as coworker of founder prior to startup	0.47	0.30	0.052†	0.294 (0.042)**	1,361

Standard errors reported in parentheses. Significance levels: † : 10% * : 5% ** : 1%

The lower panel, reporting registry data, tells a similar story. Spinoff entrepreneurs

[9]Note that responding to the first two questions depended on having received funding and the next four questions on having hired at least one employee in the first year, hence the substantial number of "missing" cases.

did not have access to greater personal financial resources, either in terms of their own wealth ($p = .581$) or that of their parents ($p = .905$). Nor did they differ in terms of their average tenure in the region, a measure of regional embeddedness previously found to benefit firm performance (Dahl and Sorenson 2012). But they did recruit different employees. The employees recruited by spinoff entrepreneurs had more overall work experience, more experience in the same four-digit industry (nearly seven times as much!), more common experience as a coworker with the entrepreneur, and longer tenure living in the region. The employees that spinoff entrepreneurs hired therefore appear of higher quality.

Motivation

Spin-off entrepreneurs may also differ in their reasons for becoming entrepreneurs. This possibility has been a central theme in much of the descriptive and theoretical research on spinoffs. In particular, several have sought to answer the question: Why do employees spin out on their own rather than remaining with their former employers? Two motives have mainly been suggested: (i) disagreements, and (ii) expropriation.

The idea of disagreements has a long history. Garvin (1983), in his early article describing spinoffs, suggested anecdotally that many spinoff entrepreneurs appeared to have had disagreements with their former employers about the future direction of their industries or of product development. They therefore left to pursue the products and strategies that their former employers rejected. Several papers have developed this idea more rigorously in the context of formal models where these disagreements emerge either because incumbent firms face different incentives for pursuing projects (e.g., Cassiman and Ueda 2006) or because their managers have less accurate perceptions of the value of novel ideas than would-be entrepreneurs (Klepper and Sleeper 2005; Klepper and Thompson 2010). These models sug-

gest that spinoff entrepreneurs should pursue more innovative and more profitable ideas than non-spinoff entrepreneurs.

Others suggest that entrepreneurs leave their former employers to profit from the human and intellectual capital that they gained during their tenure in these firms. Anton and Yao (1995), for example, developed a model in which employees who discover potentially profitable ideas quit to pursue them on their own. Since their employers do not have enforceable property rights over the inventions, these employees stand to gain more financially from founding their own firms. From these models, one might expect money to motivate spinoff entrepreneurs more than non-spinoff entrepreneurs.

The choice problem in these literatures, however, has been: Why do employees leave their employers? It has essentially been assumed that if they do leave their employers that they will remain in the same industry. But clearly many entrepreneurs also start businesses in other industries. Given that these entrepreneurs, too, have presumably gained valuable industry-specific expertise, this decision to shift to another industry seems a bit of a puzzle. We see at least two factors that might account for these decisions. First, non-spinoff entrepreneurs may perceive the expected returns to staying in their industries as being low. Through experience, these individuals may have discovered that they do not have the abilities or attributes required to succeed in an industry, or that the industry itself has poor prospects. The systematic removal of poor performers from the population may therefore account for the superior performance of spinoff entrepreneurs. Studies of firm-level diversification, for example, similarly suggest that adverse selection may account for the diversification discount—firms enter new industries when the growth of their home markets slows (Villalonga 2005).

Second, non-spinoff entrepreneurs may have decided for some (non-pecuniary) reason that

they did not like their jobs. Job satisfaction depends on a bundle of extrinsic and intrinsic rewards. Individuals differ in the extent to which they value these rewards (Kalleberg 1977). Some care about money; others may prefer a job with flexible hours, so that they can spend time with family and friends or pursuing their hobbies; still others may want a job that they find intellectually stimulating or emotionally fulfilling. Non-spinoff entrepreneurs may have discovered that something about the nature of their former job did not fit well with their preferences and therefore have decided to pursue a career in a different industry, more in line with their interests. Those choices moreover may lead them to start businesses with less promising financial prospects (because those businesses offer compensating rewards on other dimensions).

Table 3: Bivariate associations for measures of motivation

	Mean (Spinoff)	Mean (Other)	Mann-Whitney p-value	Ordered logit	N (of 1,361)
How important were disagreements with colleagues or management for your decision to start a business?	1.99	1.99	0.909	-0.011 (0.013)	1,166
How important was unemployment or a resignation to your decision to start a business?	1.84	2.07	0.000**	-0.037 (0.013)	1,171
How important is it that your job provides a high income?	2.04	2.01	0.484	0.002 (0.013)	1,323
How important is it that your job fits your skills and abilities?	2.28	2.36	0.040*	-0.027 (0.013)*	1,317
How important is it that your job strengthens your skills and abilities?	2.44	2.41	0.418	-0.000 (0.012)	1,338
How important is it that you find your work interesting?	2.70	2.72	0.496	-0.032 (0.013)	1,345
How important is it that your work involves a variety of tasks?	2.53	2.49	0.339	0.014 (0.013)	1,338
How important is it that your job allows for vacation and leisure time?	1.71	1.78	0.047*	-0.024 (0.012)†	1,331
How important is it that your job has flexible hours?	1.89	2.00	0.006**	-0.025 (0.012)*	1,314
Within the last five years, have you been unable to participate in family activities due to your job?	2.62	2.43	0.001**	0.017 (0.012)	1,321
Within the last five years, have you been unable to contribute to household chores due to your job?	3.07	2.93	0.006**	0.015 (0.012)	1,322
Within the last five years, has your job required you to work during vacation or holidays?	3.20	3.02	0.001**	0.012 (0.012)	1,323

Standard errors reported in parentheses. Significance levels: † : 10% ∗ : 5% ∗∗ : 1%

In assessing motivations, the survey proves critical. Though the Danish registry data can provide insight into the prior employment experience and the resource mobilization of all entrepreneurs, assessing their motivations requires information on their attitudes and motivations. Table 3 reports the responses to a variety of questions meant to assess entrepreneurs' reasons for starting their ventures.

The first nine questions asked entrepreneurs to choose either "very important," "important," or "not important" as a response (the first two questions also included a fourth category, "not relevant"). Beginning with the first question, spinoff entrepreneurs and non-spinoff entrepreneurs displayed almost no difference in the extent to which they reported disagreements with management as a reason for starting their businesses ($p = .909$); most, moreover, considered it unimportant to their decision to found a firm. Spinoff and non-spinoff entrepreneurs also did not appear to differ in the extent to which they cited the potential for material rewards as a motivation ($p = .484$), though here both groups considered it important, on average. Those responses therefore raise questions regarding the extent to which existing formal models capture the actual dynamics of entrepreneurial decisions.

Spinoff and non-spinoff entrepreneurs do nevertheless differ on other motivational dimensions. The responses to two different questions suggest that non-spinoff entrepreneurs actively choose to change industries: Non-spinoff entrepreneurs reported that a spell of unemployment more commonly influenced their decision to become entrepreneurs and also indicated that they placed greater importance on having a job that fit with their skills and abilities (despite changing industries).

With respect to the importance of the non-pecuniary characteristics of their jobs, the two groups did not differ in terms of the importance of self-fulfillment. Both considered it critical that they find their work interesting and that they have varied tasks.

But the two groups did differ in the extent to which they cared about work intruding on other domains of their lives. Non-spinoff entrepreneurs placed greater importance on having more flexible hours and on having jobs that would accommodate leisure and vacation time. Their self-reports of the extent to which their entrepreneurial ventures infringed on their personal lives revealed consistent patterns. On the final three questions, respondents had to indicate "regularly," "occasionally," "rarely" or "never" as an answer. Spinoff entrepreneurs reported that their jobs more frequently led them to miss out on family activities and to neglect household duties and to work during holidays and vacation. Spinoff entrepreneurs therefore appear to work in less flexible jobs and/or to work harder to ensure the success of their ventures.

Distinguishing characteristics

Though the preceding section discussed factors that might distinguish spinoff and non-spinoff entrepreneurs, it did so one variable at a time. But many of these factors likely correlate with one another or depend on common antecedents. To isolate those factors most important to differentiating spinoff entrepreneurs from other founders, we moved to a multivariate analysis.

Table 4 introduces the various variables above into a logit model of whether or not the entrepreneur entered an industry in which he had prior experience (i.e. whether the venture qualified as a spinoff).[10] We introduced these variables in three groups based on the three classes of mechanisms discussed above. Because variables that did not differ significantly in their distributions across founder types should not predict the likelihood of being a spinoff, we only included those factors that had either a significant difference in their means across

[10]To avoid the loss of cases due to missing responses, we set the values for "don't know" to the means of the relevant variables for the multivariate analyses.

the groups or a significant estimated relationship with industry experience.[11] In the final column, Model 4, we included only factors that had a significant coefficient in one of the first three models.

In the multivariate analysis, a number of factors with significant bivariate associations dropped out as being useful predictors of entrepreneur type. Several nevertheless remain: Among the measures of knowledge, spinoff entrepreneurs had more related industry experience but less managerial experience. They also came from smaller, younger and more profitable firms. With respect to access to resources, all of the measures of financial resources became insignificant, controlling for other factors. Spinoff entrepreneurs, however, still recruited more heavily from their former colleagues, therefore also hiring employees with more experience in the industry (though with less experience in other industries). Interestingly, these recruiting differences had the strongest predictive power in distinguishing spinoff from non-spinoff entrepreneurs.

Three motivational factors also continued to distinguish spinoff entrepreneurs from others: A spell of unemployment less frequently influenced spinoff entrepreneurs decisions to become entrepreneurs; spinoff entrepreneurs placed *less* importance on having a job that fit their abilities and attributes; and spinoff entrepreneurs more frequently reported working on holidays and vacations.

Though our discussion and analysis has treated all entrepreneurs as though they behave uniformly, the reasons that entrepreneurs remain within an industry instead of moving to a new one might vary across industries. For example, those interested in a "lifestyle" business might gravitate towards retail. Although the size of the survey sample does not allow

[11] To ensure that the absence of a bivariate association did not depend on some suppressor relationship with a third variable, we also ran a version of Table 4 with all of the variables. None with insignificant bivariate associations had a significant coefficient at the .05 level.

Table 4: Logit estimates of likelihood of being a spin-off

	(1)	(2)	(3)	(4)
Work experience (years)	0.003			
	(0.007)			
Related industry experience, 2-digit (years)	0.034*			0.037*
	(0.014)			(0.015)
Managerial experience (years)	-0.071*			-0.054†
	(0.033)			(0.032)
Parent firm age	-0.011**			-0.012**
	(0.004)			(0.004)
Parent firm size	-0.000**			-0.000*
	(0.000)			(0.000)
Parent firm ROA	1.586**			1.306**
	(0.348)			(0.357)
Did you receive a loan or investment from family, friends or other acquaintances?		-0.061		
		(0.153)		
How many of the initial employees were close family?		-0.486*		-0.340
		(0.214)		(0.214)
How many of the initial employees were former colleagues?		0.604**		0.612**
		(0.162)		(0.166)
How many of the initial employees were other friends or acquaintances?		0.147		
		(0.213)		
Region tenure (years)		0.001		
		(0.010)		
Employee work experience (years)		-0.045**		-0.043**
		(0.016)		(0.014)
Employee industry experience (years)		0.453**		0.444**
		(0.059)		(0.061)
Employee region tenure (years)		0.010		
		(0.025)		
Common experience (years)		0.019		
		(0.052)		
How important was unemployment or a resignation to your decision to start a business?			-0.269**	-0.221**
			(0.070)	(0.073)
How important is it that your job fits your skills and abilities?			-0.218*	-0.244*
			(0.098)	(0.104)
How important is it that your job allows for vacation and leisure time?			-0.009	
			(0.094)	
How important is it that your job has flexible hours?			-0.161†	
			(0.094)	
Within the last five years, have you been unable to participate in family activities due to your job?			0.111	
			(0.073)	
Within the last five years, have you been unable to contribute to household chores due to your job?			0.059	
			(0.083)	
Within the last five years, has your job required you to work during vacation or holidays?			0.133†	0.157*
			(0.075)	(0.070)
Constant	-0.593**	-1.093**	-0.168	-0.531
	(0.119)	(0.412)	(0.427)	(0.481)
Pseudo R^2	0.04	0.08	0.02	0.12
Log-likelihood	-842	-807	-853	-773
Observations	1,361	1,361	1,361	1,361

Standard errors reported in parentheses. Significance levels: † : 10% * : 5% ** : 1%

us to slice it too thinly, we explored whether the characteristics distinguishing spinoff and non-spinoff entrepreneurs differed by industry entered in two ways. First, we categorized industries into three broad groups: traditional manufacturing (271 firms), modern manufacturing (111 firms; essentially high tech), and services (979 firms) and interacted these categories with each of the variables in the final model (using services as the baseline category). None of these interactions met the $p < .05$ level.

Second, we calculated the growth rate of each four-digit industry (across all firms in Denmark) and used that growth rate to split the sample into terciles: declining, stable and growing industries. We again interacted these categories with each of the variables in the final model (using stable industries as the baseline). Only one interaction proved significant: Among those entering growing industries, the extent to which a spell of unemployment influenced their decision to become an entrepreneur did not differ between spinoff and non-spinoff entrepreneurs.

Performance

Even if spinoff and non-spinoff entrepreneurs differ, they do not help to explain the performance advantage enjoyed by spinoffs unless those factors also contribute in some way to firm performance. We therefore explicitly investigated the extent to which these various factors might account for the spinoff advantage.

We began exploring the performance implications by analyzing the functional form of the relationship between survival and years of industry experience using a flexible, non-parametric specification. We regressed the exit rate for startups on a vector of indicator variables for each possible number of years of prior experience in the four-digit industry (0 for non-spinoffs). Figure 2 displays the estimated coefficient for each indicator, as well as its

95% confidence interval.

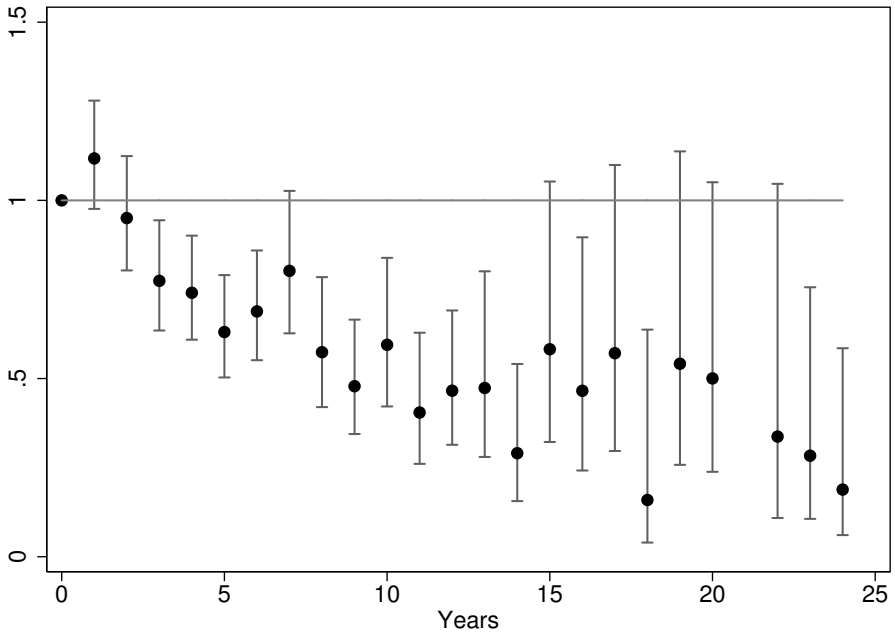

Figure 2: Multiplier rate of exit by years of industry experience

This analysis has two purposes. First, it gives us some insight into whether selection or maturation processes contribute more strongly to the spinoff advantage. If selection processes dominate, then one would expect a step function—a relatively constant difference regardless of time in the industry. If, on the other hand, maturation processes – such as the accrual of human or social capital – prove paramount then one would expect the differential to grow with experience. From the figure, it appears that the advantage of spinoffs rises with the industry experience of their founders, consistent with maturation processes (if anything, selection actually seems somewhat negative, with spinoffs with only one year of industry experience doing worse than non-spinoffs).

The second purpose is to establish the appropriate functional form for including industry experience with other measures in the analysis of firm performance. The individual coefficient

estimates increase in magnitude but at a decreasing rate. In fact, the piece-wise coefficients do not differ significantly from the predictions produced by the logged number of years (plus one to avoid logging zero). We therefore simplified the specification to logged years of industry experience.

Table 5 examines firm performance in a multivariate context. The first column includes only the founder's logged years of prior industry experience. Prior experience has a significant and large effect on exit rates; a doubling in industry experience decreases the failure rates of firms by 17.6%. Since the average spinoff entrepreneur has more than six years of experience in the industry, he enjoys roughly 38% ($= 1 - e^{-.235 \times \ln(6.47+1)}$) lower failure rates than the average non-spinoff entrepreneur.

Models 6 through 9 then enter those factors that distinguished spinoff entrepreneurs from non-spinoff founders. Several appear unrelated to startup performance. Somewhat surprisingly, prior managerial experience does not have a significant relationship with survival rates. Parent firm size and profitability also have weak relationships, at best, to the performance of their progeny. Most of the differences in recruiting patterns also appear to have little effect on startup performance.

In total, only five of the eleven variables distinguishing spinoff and non-spinoff entrepreneurs had significant partial correlations with startup survival. Founder experience in related industries reduced the failure rates of their ventures. Since spinoff entrepreneurs more commonly had experience in related industries as well, this effect accounted for a portion of the spinoff advantage. Entrepreneurs who had previously worked in *older* firms also had lower failure rates. That's somewhat surprising because previous research had found entrepreneurs coming from smaller (and presumably younger) firms to have lower failure rates (Sørensen and Phillips 2011). It also means that estimates of the performance advantages

Table 5: Piece-wise exponential stimates of startup exit rates

	(5)	(6)	(7)	(8)	(9)
Industry experience, 4-digit (years, logged)	-0.235**	-0.204**	-0.187**	-0.195**	-0.145**
	(0.051)	(0.053)	(0.053)	(0.051)	(0.052)
Related industry experience, 2-digit (years, logged)		-0.127*			-0.108*
		(0.051)			(0.052)
Managerial experience (years, logged)		-0.077			
		(0.078)			
Parent firm age (logged)		-0.144**			-0.115**
		(0.040)			(0.040)
Parent firm size (logged)		0.032†			0.021
		(0.019)			(0.019)
Parent firm ROA		0.049†			0.039
		(0.029)			(0.029)
How many of the initial employees were close family?			0.189		
			(0.144)		
How many of the initial employees were former colleagues?			0.033		
			(0.128)		
Employees work experience (years, logged)			-0.258**		-0.236**
			(0.058)		(0.048)
Employees industry experience (years, logged)			-0.077		
			(0.127)		
How important was unemployment or a resignation to your decision to start a business?				0.182**	0.144**
				(0.047)	(0.046)
How important is it that your work fits your skills and abilities?				-0.020	
				(0.072)	
Within the last five years, has your job required you to work during vacation or holidays?				-0.288**	-0.275**
				(0.044)	(0.044)
Age dummies	Yes	Yes	Yes	Yes	Yes
Log-likelihood	-1,396	-1,382	-1,376	-1,368	-1,344
Firms	1,361	1,361	1,361	1,361	1,361

Standard errors reported in parentheses. Significance levels: † : 10% ∗ : 5% ∗∗ : 1%

associated with spinoffs may underestimate those benefits because spinoff entrepreneurs, on average, come from younger organizations (a disadvantage).

Having employees with more work experience overall also had a positive relationship with firm performance. But again, surprisingly, it did not matter in what industry employees had gained their experience: Experience in the same industry had no more value than experience in other industries.

Finally, entrepreneurs motives for starting their own businesses also predicted firm performance. Those who became entrepreneurs because they had experienced a spell of unemployment had ventures with higher failure rates. Lesser abilities may account for both their earlier loss of a job and the later failure of their firms. Since non-spinoff entrepreneurs more frequently experienced these spells of unemployment prior to starting their firms, selection on abilities therefore may account for some of the spinoff advantage.

Entrepreneurs willing to work on holidays and vacations also had lower failure rates. That's not surprising. One would generally expect a positive relationship between effort and performance. But again, since spinoff entrepreneurs reported forgoing these leisure days more frequently, this too may account for part of the positive performance associated with prior experience in the industry.

Together, these factors appeared to account for roughly one-third of the spinoff advantage, as the coefficient for industry experience declines substantially after controlling for these factors. But founder industry experience continued to have a direct, positive relationship on the performance of their firms. Why? One possibility is that the factors explored do completely mediate the relationship between industry experience and performance but that measurement error prevents us from adequately controlling for them (Judd and Kenny 1981). Another is that we have omitted some important mechanism captured by the residual differ-

ential. A third (likely) possibility is that industry-specific organizational and technological knowledge accounts for much of this effect.

We also explored heterogeneity in these effects across industries. Even if similar factors distinguish spinoff entrepreneurs across industries, they may nonetheless differ in their implications for performance. We again split the startups into three sectors – traditional manufacturing, modern manufacturing and services – but again observed no significant differences across these sectors. We also tried grouping the startups again by the growth rates of their industries. Here, some interactions emerged (see Table 6), at least one of which seemed interesting. The residual effect of experience discussed above stems almost entirely from its effect in growing industries. Another possible explanation then is that industry-specific knowledge benefits spinoffs most at the earlier stages of industry evolution, before important innovations become diffused throughout the population.

Table 6: Piece-wise exponential estimates of startup exit rates

	(10)	(11)	(12)
Industry	Declining	Stable	Growing
Industry experience, 4-digit (years, logged)	-0.116	-0.054	-0.407**
	(0.078)	(0.092)	(0.127)
Related industry experience, 2-digit (years, logged)	-0.047	-0.034	-0.119
	(0.079)	(0.099)	(0.130)
Parent firm age (logged)	-0.085	-0.098	-0.096
	(0.059)	(0.085)	(0.087)
Parent firm size (logged)	0.001	0.005	0.045
	(0.029)	(0.039)	(0.038)
Parent firm ROA	0.027	0.056	0.004
	(0.041)	(0.059)	(0.064)
Employees work experience (years, logged)	-0.212*	-0.340**	-0.170*
	(0.086)	(0.098)	(0.082)
How important was unemployment or a resignation	0.205**	0.074	-0.057
to your decision to start a business?	(0.064)	(0.103)	(0.114)
Within the last five years, has your job required	-0.288**	-0.242*	-0.209*
you to work during vacation or holidays?	(0.064)	(0.097)	(0.095)
Age dummies	Yes	Yes	Yes
Log-likelihood	-621	-322	-280
Observations	583	365	300

Standard errors reported in parentheses. Significance levels: † : 10% * : 5% ** : 1%

Discussion

Drawing on data from Denmark, we found that spinoff entrepreneurs differed from those without industry experience in numerous ways. They had less managerial experience but more experience both in the industry they entered and in related ones. Spinoff entrepreneurs had previously been employed in smaller, younger and more profitable firms. When starting their businesses, they recruited as employees fewer from their family and more who had previously been coworkers. Spinoff entrepreneurs also appeared to work harder and to care less about having a job with flexible hours. They also less likely entered entrepreneurship from a spell of unemployment.

Only a few of these differences, however, appeared to contribute to the better performance of spinoffs. Notably, the recruitment of more experienced employees, having not had a prior spell of unemployment, and exerting greater effort each accounted for a portion of the performance benefits associated with prior experience in the industry. But, even after accounting for these differences, spinoffs still outperformed non-spinoffs.

Though our results could not isolate one particular mechanism that accounted for the outperformance of spinoffs, they do usefully inform the debates surrounding spinoffs. For example, one prominent claim has been that spinoffs originate from employees who have had disputes with management over the strategic directions of their companies. When they cannot convince management to adopt their visions, they pursue them on their own (e.g., Klepper 2007; Klepper and Thompson 2010). Though anecdotal accounts suggest that this scenario does occur occasionally, entrepreneurs rarely reported disagreements as being an important factor in their decisions to start their firms, and spinoff entrepreneurs appeared no more likely to have reported disagreements as a motive.

Another claim has appeared in the literature on agglomeration, where spinoffs have been

seen as an important source of within-region spillovers, as employees leave the largest and most profitable firms to establish their own companies (Klepper 2007; Greenstone et al. 2010). Klepper (2007), for example, argues that this process accounted for the rise of Detroit as the center of the automobile industry. However, we found little to support this idea. Human capital clearly matters. Survival rates increased with both industry experience and related industry experience. But the value of this industry experience did not depend on its source. Spinoffs may still contribute to agglomeration, but the reason probably stems more from the simple fact that having previously been employed in the industry means that these entrepreneurs live in close proximity to incumbents and therefore they generally locate their companies near to them (Sorenson and Audia 2000; Dahl and Sorenson 2009).

By contrast, our results suggest at least two fruitful avenues for future research. First, who startups hire and how those hires influence their performance deserves much more attention. Spinoff entrepreneurs recruited employees of higher apparent quality, which appeared to contribute to their performance advantage. Does this recruiting effect represent a return on industry-specific social capital, awareness of who one would want to hire and the ability to convince them to join the venture? Or do spinoff entrepreneurs simply have better ideas or other attributes that attract more able employees? Though both practitioners and academics would generally agree that the success of startups depends in large part on the quality of its early employees, relatively little systematic research has been done on this issue (for important exceptions, see Ruef et al. 2003; Ruef 2010; Timmermans 2010).

Second, researchers need to know more about why individuals become entrepreneurs and why they choose the industries they enter. We found substantial evidence of (self-) selection effects. Those entering industries in which they had prior experience appear to work harder and to have interests and abilities that fit better with the demands of those industries. These

differences, moreover, appear to matter to startup performance. With few exceptions (e.g., Nanda and Sørensen 2010; Dahl and Sorenson 2012; Kulchina 2012), however, studies of entrepreneurs have paid little attention to the extent to which who becomes an entrepreneur and the industries and locations they choose depends on differences in the people and the social context of those involved.

In concluding, however, we would note that overall the attitudinal measures revealed fewer differences and contributed far less to understanding the performance of startups than the measures derived from the archival data. That bodes well for the future of using registry data to continue to push forward research on entrepreneurship.

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Appendix

Our study draws on a dataset created by connecting a representative cross-sectional survey of 1,446 first-time entrepreneurs in Denmark to longitudinal Danish census data—in particular, the matched employee-employer database known by its Danish acronym, IDA. The survey provides insight into the motivations and startup activities of entrepreneurs while the census data allow us to track entrepreneurs (and their employees) for 23 years prior to entering into entrepreneurship and for four years following the establishment of their firms.

The survey comprised questions relevant to entrepreneurship from a number of well-established instruments, including the European Values Study, the General Enterprising Tendency Test (GET2), the General Social Survey, and the survey on Factors of Business Success (FOBS). It also included additional questions on the extent to which entrepreneurs relied on social relationships for support in their startups. Dahl et al. (2009) provides a complete description of the sampling, the survey design and questions, and the responses received (Appendix G includes a copy of the complete survey instrument).

Statistics Denmark mailed the survey in the spring of 2008, collected and coded the responses, and linked the survey data to the IDA. It derived the sample on the basis of information from IDA. The sampling frame included all people living in Denmark of working age (15 to 66 in 2004). The primary group for the survey, entrepreneurs, comprised only those who had started a business in 2004 (N=6,799). Restricting this set to those who had never previously founded a firm reduced the number eligible to 4,586. Statistics Denmark sent surveys to this entire population of first-time entrepreneurs and received 1,446 completed questionnaires (a 31.5% response rate). Statistics Denmark also sent surveys to a secondary group, a matched random sample of non-entrepreneurs. Note, however, that our analyses do not use any of the respondents from this comparison set.

Because the original sample had been selected from the IDA data, Statistics Denmark had extensive information on those who did not respond. Nielsen (2011) analyzed and documented the differences between respondents and non-respondents in detail. His comparisons revealed that female, older, married, native Danish, higher earning, more wealthy and more educated individuals responded at significantly higher rates. However, these groups differed little in terms of absolute differences in response rates. The large sample size simply meant that he had substantial statistical power for precisely identifying even small differences.

Figure 3 depicts the hazard rates for the firms started by the spinoff and non-spinoff survey respondents. Though the pattern here appears consistent with that observed in the population as a whole (see Figure 1), it differs in two ways from the entire 2004 population of entrepreneurs. First, the sample of respondents, both the spinoffs and the non-spinoffs, had higher survival rates, on average. Second, in the sample of respondents, spinoff and non-spinoff entrepreneurs differed somewhat less in their performance than in the population as a whole. Given these facts, our findings probably understate the differences between spinoff and non-spinoff entrepreneurs.

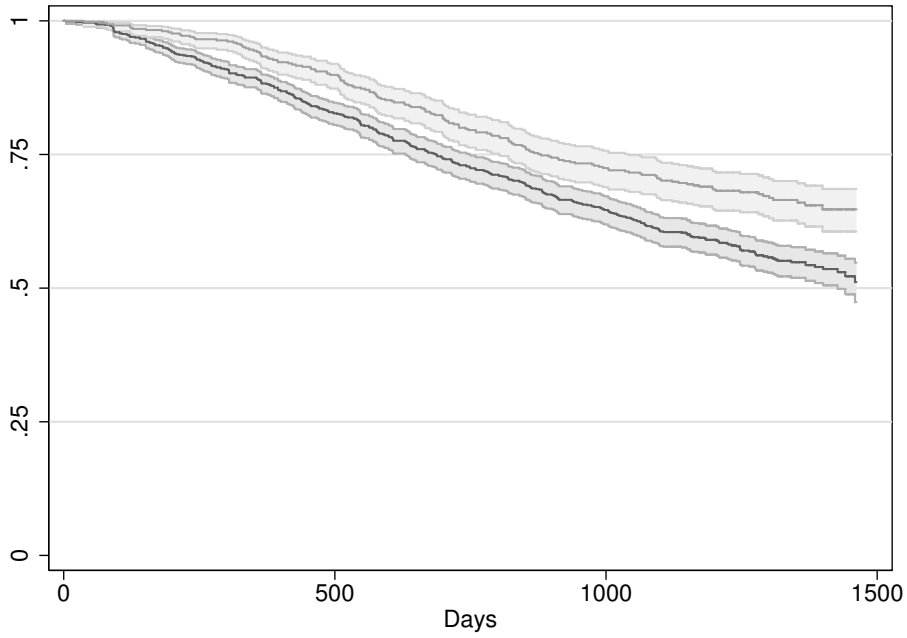

Figure 3: Kaplan-Meier survival plot for spinoffs (light) and non-spinoffs (dark) among survey respondents.